USEFUL FOR UNIVERSITY EXAMS, GATE, NET AND OTHER CS EXAMS

DATABASE MANAGEMENT SYSTEM

DATABASE MODELS

PROPER NOTES IN PPT FORM

PART -7



DATABASE MODELS

It determines the logical structure of a database and fundamentally determines in which manner data can be stored, organized and manipulated.

There are four common types of database model that are useful for different types of data or information. Depending upon your specific needs, one of these models can be used.

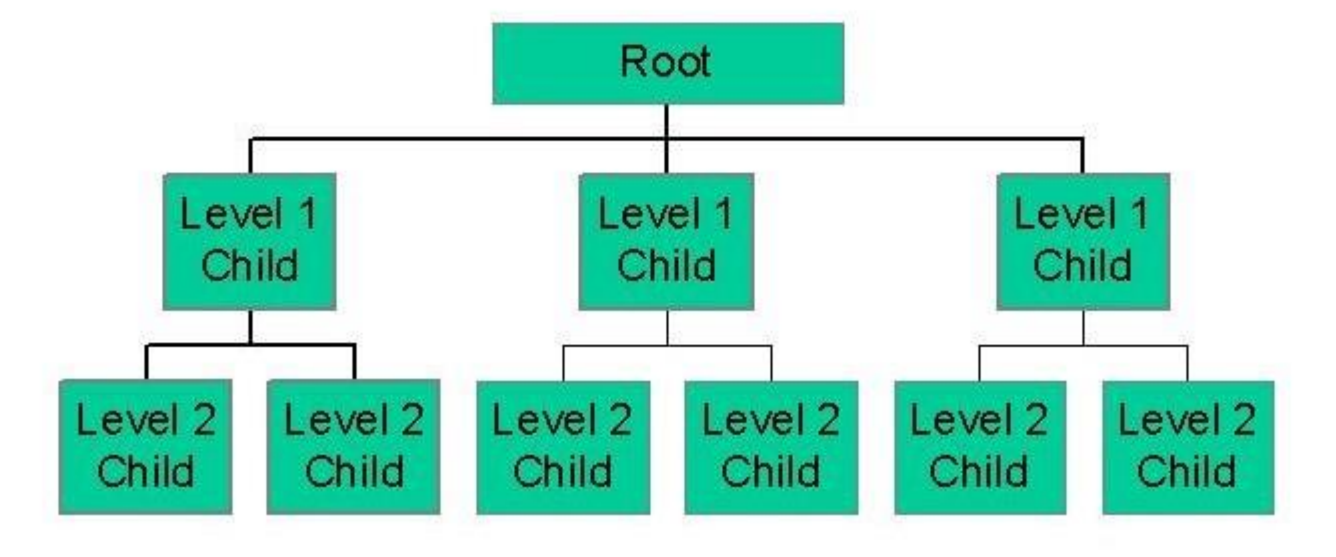
1. Hierarchical databases.
2. Network databases.
3. Relational databases.
4. Object-oriented databases.

1. Hierarchical databases

- It is one of the oldest database model developed by IBM for information Management System.
- In a hierarchical database model, the data is organized into a tree-like structure.
- Its structure is like a tree with nodes representing records and branches representing fields.
- The windows registry used in Windows XP is an example of a hierarchical database. Configuration settings are stored as tree structures with nodes.
- This type of database employs the “parent-child” relationship of storing data.

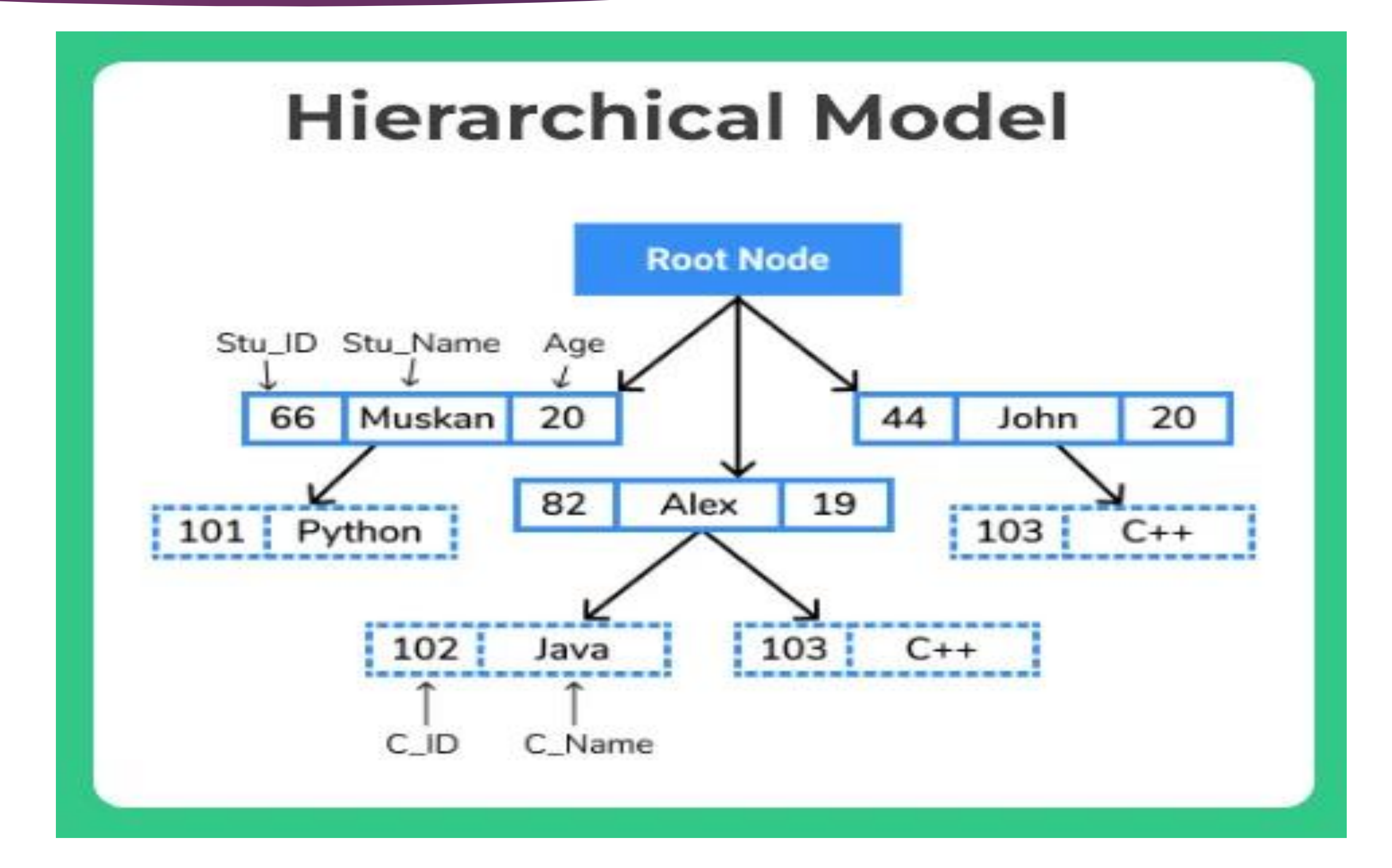
Features of the hierarchical model

- A child node will have only ***one parent node***
- One to many relationship: Hierarchical model is implemented ***based on one to many relationship***.Based on this a***ny parent node should have more than one child nodes i.e one parent for many child.***



Example for hierarchical model

- Example of students and courses where a course can be assigned to a single student where as student can take a number of courses hence ***one to many relationship is observed***.



Advantages

- The model allows us easy addition and deletion of new information.
- Data at the top of the Hierarchy is very fast to access.
- It worked well with linear data storage mediums such as tapes.
- It relates well to anything that works through a one to many relationships. For example; there is a president with many managers below them, and those managers have many employees below them, but each employee has only one manager.

Disadvantages

- It requires data to be repetitively stored in many different entities.
- Now a day there is no longer use of linear data storage mediums such as tapes.
- Searching for data requires the DBMS to run through the entire model from top to bottom until the required information is found, making queries very slow.
- This model support only one to many relationships, many to many relationships are not supported.

2. Network databases

- Network database model organised data more like a graph and can have more than one parent node.
- The network model is a database model conceived as a flexible way of representing objects and their relationships.
- This was the most widely used model ***before the relational database model was introduced***

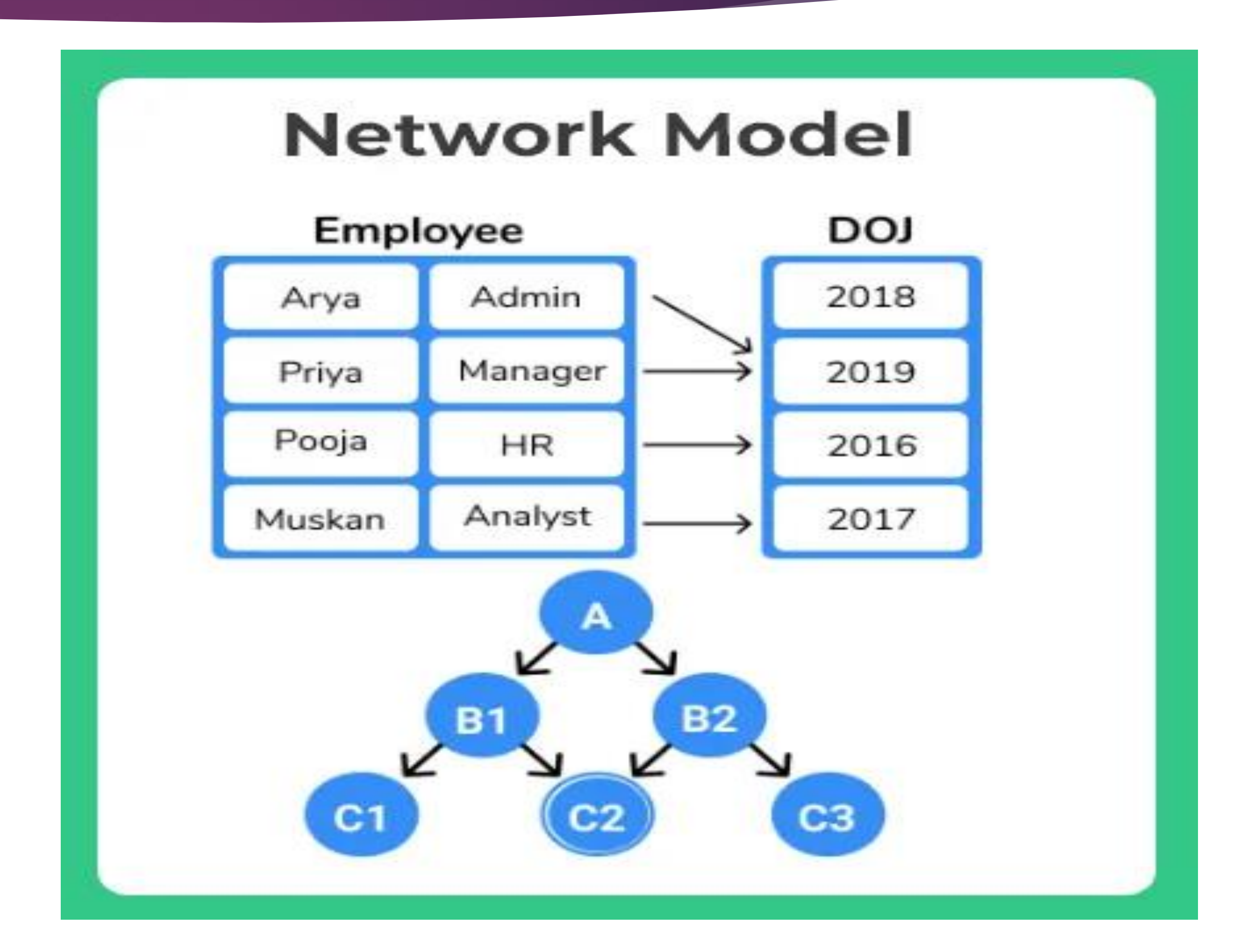
Features of the network data model

- It was introduced to overcome the drawbacks of the hierarchical model because the ***hierarchical model uses one to many relationship as a result only a few relationships can be established.***
- Many to many relationships: But here in network model It uses many to many relationship where ***the child only is allowed to have more than one parent node as a result large number of relationships can be applied with different data tables and data access becomes easier and faster .***

EXAMPLE

- Consider two tables "employee" table and "date of joining" table with the help of this network model ***more than one employee record can be linked to 2 more than and one record in the "date of joining" table***

- For example, as shown in the figure both admin and HR uses the same data row present in the date of joining table i.e [2014] as a result data duplicate is reduced .



Advantages of the network model

- As ***more number of relationships or established between data tables it reduces data duplicity saves memory*** improve access time of data.
- The network model is conceptually simple and easy to design.
- The network model can represent redundancy in data more effectively than in the hierarchical model.
- The network model can handle the one to many and many to many relationships which is real help in modelling the real-life situations.
- The data access is easier and flexible than the hierarchical model.
- The network model is better than the hierarchical model in isolating the programs from the complex physical storage details.

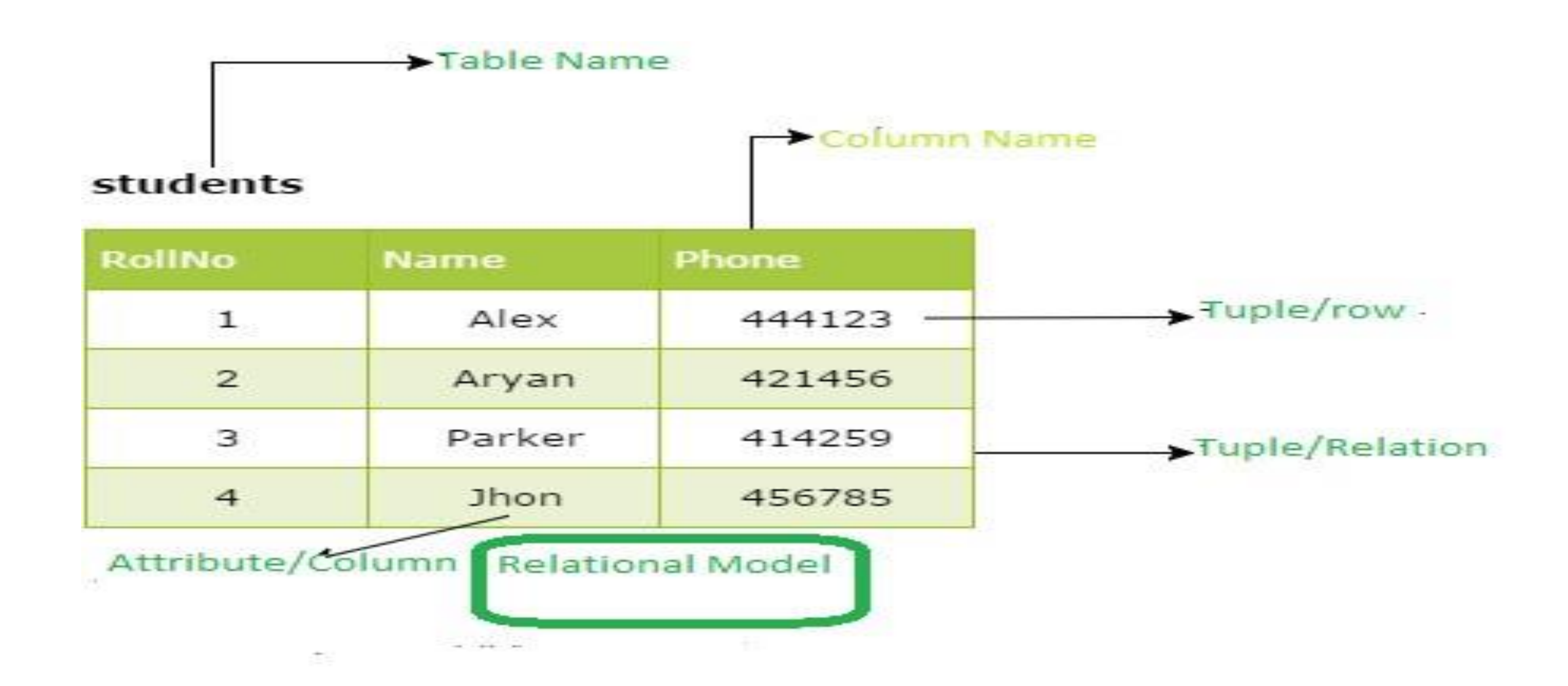
Disadvantage:

- All the records are maintained using pointers and hence the whole database structure becomes very complex.
- The insertion, deletion and updating operations of any record require the large number of pointers adjustments.
- The structural changes to the database is very difficult.

3. Relational Database

- A relational database is developed by E. F. Codd in 1970.
- The various software systems used to maintain relational databases are known as a relational database management system (RDBMS).
- In this model, data is organised in rows and column structure i.e., two-dimensional tables and the relationship is maintained by storing a common field.
- In relational model, three key terms are heavily used such as relations, attributes, and domains.
- A **relation** nothing but is a table with rows and columns.
- The named columns of the relation are called as **attributes**
- **Domain** is nothing but the set of values the attributes can take.

TABLES



RollNo	Name	Phone
1	Alex	444123
2	Aryan	421456
3	Parker	414259
4	Jhon	456785

Terminology used in Relational Model

- **Tuple**: Each row in a table is known as tuple.
- **Cardinality of a relation**: The number of tuples in a relation determines its cardinality. In this case, the relation has a cardinality of 4.
- **Degree of a relation**: Each column in the tuple is called an attribute. The number of attributes in a relation determines its degree. The relation in figure has a degree of 3.

Keys of a relation-

- Primary key- it is the key that uniquely identifies a table. It doesn’t have null values.
- Foreign key- it refers to the primary key of some other table.it permits only those values which appear in the primary key of the table to which it refers.

WATCH NEXT Video FOR all KEYS with NOTES

Example of relational database

- Oracle: Oracle Database is commonly referred to as Oracle RDBMS or simply as Oracle. It is a multi-model database management system produced and marketed by Oracle Corporation.
- MySQL: MySQL is an open-source relational database management system (RDBMS) based on Structured Query Language (SQL). MySQL runs on virtually all platforms, including Linux, UNIX, and Windows.
- Microsoft SQL Server: Microsoft SQL Server is an RDBMS that supports a wide variety of transaction processing, business intelligence, and analytics applications in corporate IT environments.

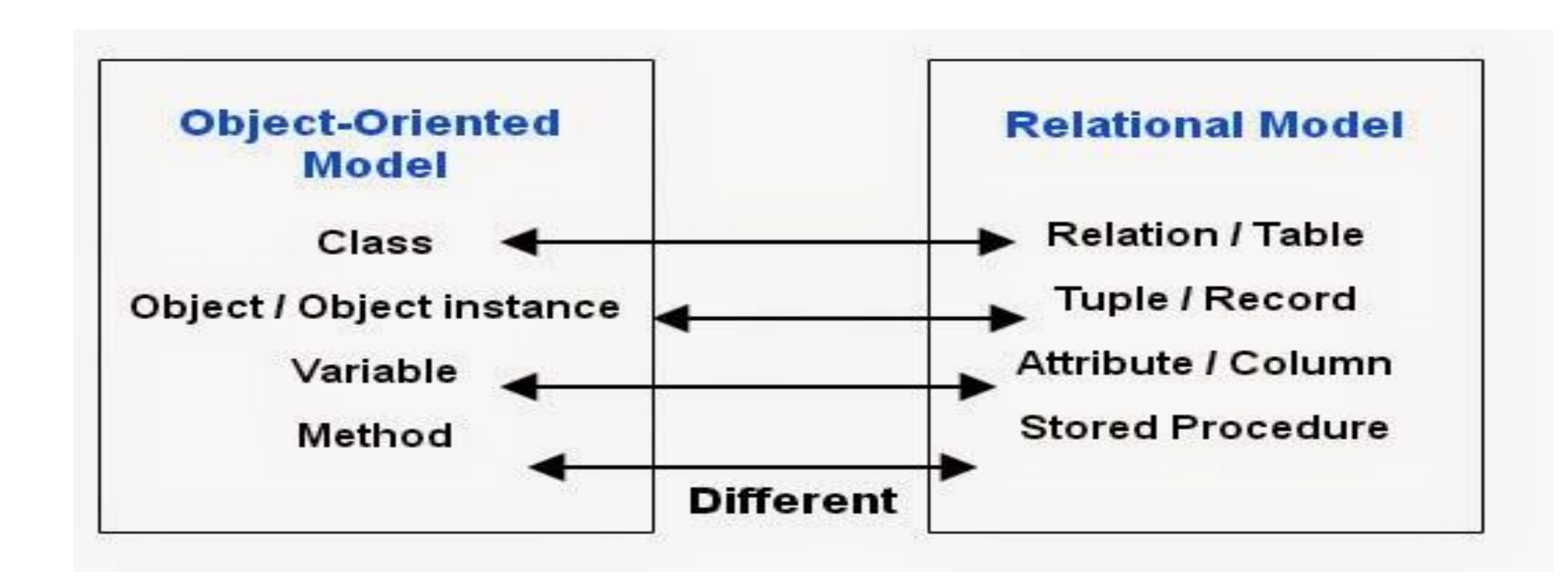
Advantage

- ***Data integrity*** for accuracy and consistency
- ***No data redundancy***
- ***Access control and integrity*** in the form of constraints which enables validation before entering and accessing the data
- Provides ***high security***
- Supports to ***store any type any data types***(numbers, characters, date, images, audios, text files)
- Data can be ***managed and used by several users*** at a time.
- Data can be ***shared across several platforms.***
- In relational model, changes in the database structure do not affect the data access.
- The revision of any information as tables consisting of rows and columns is much easier to understand.
- In this we can write complex query to accesses or modify the data from database.

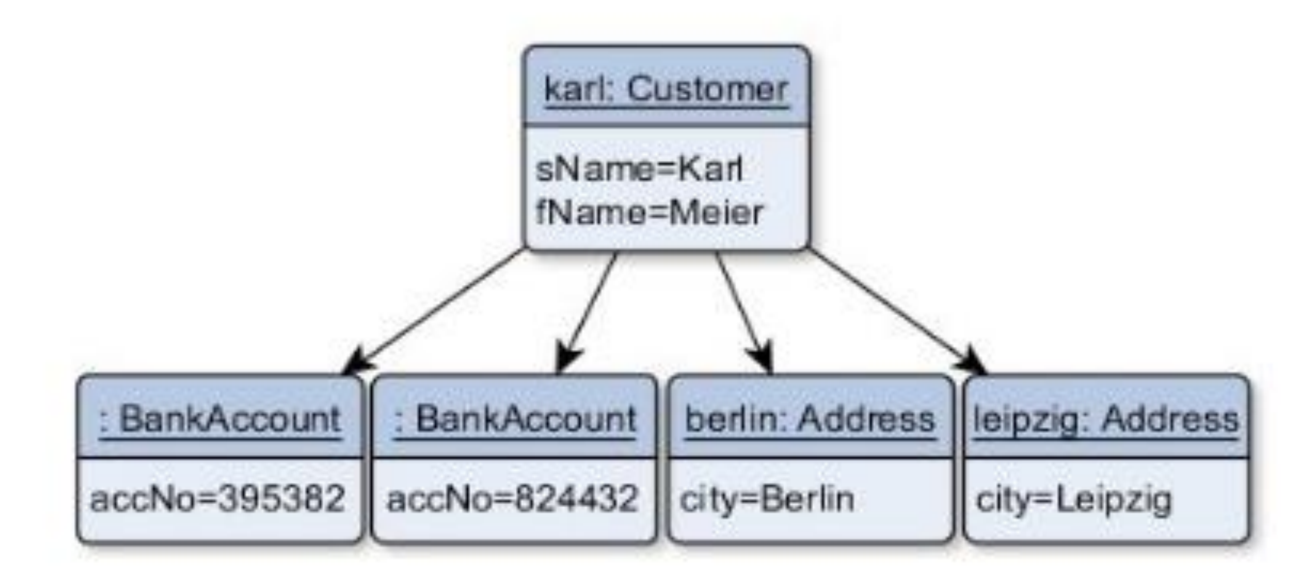
4. Object-oriented databases

- An object database is a system in which information is represented in the form of objects as used in object-oriented programming.
- The object-oriented data model is based on the object-oriented-programming language concept, which is now in wide use.
- Inheritance, polymorphism, overloading. object-identity, encapsulation and information hiding with methods to provide an interface to objects, are among the key concepts of object-oriented programming that have found applications in data modelling.
- The object-oriented data model also supports a rich type system, including structured and collection types.

Difference between relation and object-oriented database model



Example of object-oriented model



Advantages

- Object database can handle different types of data while relational data base handles a single data. Unlike traditional databases like hierarchical, network or relational, the object-oriented databases can handle the different types of data, for example, pictures, voice video, including text, numbers and so on.
- Object-oriented databases provide us code reusability, real world modelling, and improved reliability and flexibility.
- The object-oriented database is having low maintenance costs as compared to other model because most of the tasks within the system are encapsulated, they may be reused and incorporated into new tasks.

Disadvantages

- There is no universally defined data model for an OODBMS, and most models lack a theoretical foundation.
- In comparison to RDBMSs the use of OODBMS is still relatively limited.
- There is a Lack of support for security in OODBMSs that do not provide adequate security mechanisms.
- The system more complex than that of traditional DBMSs.

THANK YOU

